



Indiana's academic standards for science contain six standards. Each standard is described below. On the pages that follow, age-appropriate concepts are listed underneath each standard. These ideas build a foundation for understanding the intent of each standard.

Standard 1 — The Nature of Science and Technology

It is the union of science and technology that forms the scientific endeavor and that makes it so successful. Although each of these human enterprises has a character and history of its own, each is dependent on and reinforces the other. This first standard draws portraits of science and technology that emphasize their roles in the scientific endeavor and reveal some of the similarities and connections between them. In order for students to truly understand the nature of science and technology, they must model the process of scientific investigation through inquiries, fieldwork, lab work, etc. Through these experiences, students will practice designing investigations and experiments, making observations, and formulating theories based on evidence.

Standard 2 — Scientific Thinking

There are certain thinking skills associated with science, mathematics, and technology that young people need to develop during their school years. These are mostly, but not exclusively, mathematical and logical skills that are essential tools for both formal and informal learning and for a lifetime of participation in society as a whole. Good communication is also essential in order to both receive and disseminate information and to understand other's ideas as well as have one's own ideas understood. Writing, in the form of journals, essays, lab reports, procedural summaries, etc., should be an integral component of students' experience in science.

Standard 3 — The Physical Setting

One of the grand success stories of science is the unification of the physical universe. It turns out that all natural objects, events, and processes are connected to each other. This standard contains recommendations for basic knowledge about the overall structure of the universe and the physical principles on which it seems to run. This standard focuses on two principle subjects: the structure of the universe and the major processes that have shaped planet Earth, and the concepts with which science describes the physical world in general – organized under the headings of *Matter and Energy* and *Forces of Nature*. In Grade 2, students learn that change is a continual process.

Standard 4 — The Living Environment

People have long been curious about living things – how many different species there are, what they are like, how they relate to each other, and how they behave. Living organisms are made of the same components as all other matter, involve the same kinds of transformations of energy, and move using the same basic kinds of forces. Thus, all of the physical principles discussed in Standard 3 – The Physical Setting, apply to life as well as to stars, raindrops, and television sets. This standard offers recommendations on basic knowledge about how living things function and how they interact with one another and their environment. In Grade 2, students learn that although diverse, living things are dependent on one another and the environment.



Standard 5 — The Mathematical World

Mathematics is essentially a process of thinking that involves building and applying abstract, logically connected networks of ideas. These ideas often arise from the need to solve problems in science, technology, and everyday life — problems ranging from how to model certain aspects of a complex scientific problem to how to balance a checkbook.

Standard 6 — Common Themes

Some important themes pervade science, mathematics, and technology and appear over and over again, whether we are looking at ancient civilization, the human body, or a comet. These ideas transcend disciplinary boundaries and prove fruitful in explanation, in theory, in observation, and in design. A focus on *Constancy and Change* within this standard provides students opportunities to engage in long-term and on-going laboratory and field work, and thus understand the role of change over time in studying The Physical Setting and The Living Environment.



Standard 1

The Nature of Science and Technology

Students are actively engaged in exploring how the world works. They explore, observe, count, collect, measure, compare, and ask questions. They discuss observations and use tools to seek answers and solve problems. They share their findings.*

Scientific Inquiry

- 2.1.1 Manipulate an object to gain additional information about it.
- 2.1.2 Use tools — such as thermometers, magnifiers, rulers, or balances — to gain more information about objects.
- 2.1.3 Describe, both in writing and verbally, objects as accurately as possible and compare observations with those of other people.
- 2.1.4 Make new observations when there is disagreement among initial observations.

The Scientific Enterprise

- 2.1.5 Demonstrate the ability to work with a team but still reach and communicate one's own conclusions about findings.

Technology and Science

- 2.1.6 Use tools to investigate, observe, measure, design, and build things.
- 2.1.7 Recognize and describe ways that some materials — such as recycled paper, cans, and plastic jugs — can be used over again.

* observation: gaining information through the use of one or more of the senses, such as sight, smell, etc.

Standard 2

Scientific Thinking

Students begin to find answers to their questions about the world by using measurement, estimation, and observation as well as working with materials. They communicate with others through numbers, words, and drawings.

Computation and Estimation

- 2.2.1 Give estimates of numerical answers to problems before doing them formally.
- 2.2.2 Make quantitative estimates of familiar lengths, weights, and time intervals and check them by measurements.
- 2.2.3 Estimate and measure capacity using cups and pints.



Manipulation and Observation

- 2.2.4 Assemble, describe, take apart, and/or reassemble constructions using such things as interlocking blocks and erector sets. Sometimes pictures or words may be used as a reference.

Communication Skills

- 2.2.5 Draw pictures and write brief descriptions that correctly portray key features of an object.

Standard 3

The Physical Setting

Students investigate, describe, and discuss their natural surroundings. They wonder why things move and change.

Earth and the Processes That Shape It

- 2.3.1 Investigate by observing and then describe that some events in nature have a repeating pattern, such as seasons, day and night, and migrations.
- 2.3.2 Investigate, compare, and describe weather changes from day to day but recognize, describe, and chart that the temperature and amounts of rain or snow tend to be high, medium, or low in the same months every year.
- 2.3.3 Investigate by observing and then describe chunks of rocks and their many sizes and shapes, from boulders to grains of sand and even smaller.
- 2.3.4 Investigate by observing and then describe how animals and plants sometimes cause changes in their surroundings.

Matter and Energy

- 2.3.5 Investigate that things can be done to materials — such as freezing, mixing, cutting, heating, or wetting — to change some of their properties. Observe that not all materials respond in the same way.
- 2.3.6 Discuss how people use electricity or burn fuels, such as wood, oil, coal, or natural gas, to cook their food and warm their houses.

Forces of Nature

- 2.3.7 Investigate and observe that the way to change how something is moving is to give it a push or a pull.
- 2.3.8 Demonstrate and observe that magnets can be used to make some things move without being touched.



Standard 4

The Living Environment

Students ask questions about a variety of living things and everyday events that can be answered through observations. They consider things and processes that plants and animals need to stay alive. Students begin to understand plant and animal interaction.

Diversity of Life

- 2.4.1 Observe and identify different external features of plants and animals and describe how these features help them live in different environments.

Interdependence of Life

- 2.4.2 Observe that and describe how animals may use plants, or even other animals, for shelter and nesting.
- 2.4.3 Observe and explain that plants and animals both need to take in water, animals need to take in food, and plants need light.
- 2.4.4 Recognize and explain that living things are found almost everywhere in the world and that there are somewhat different kinds in different places.
- 2.4.5 Recognize and explain that materials in nature, such as grass, twigs, sticks, and leaves, can be recycled and used again, sometimes in different forms, such as in birds' nests.

Human Identity

- 2.4.6 Observe and describe the different external features of people, such as their size, shape, and color of hair, skin, and eyes.
- 2.4.7 Recognize and discuss that people are more like one another than they are like other animals.
- 2.4.8 Give examples of different roles people have in families and communities.



Standard 5

The Mathematical World

Students apply mathematics in scientific contexts. They use numbers for computing, estimating, naming, measuring, and communicating specific information. They make picture and bar graphs. They recognize and describe shapes and patterns. They use evidence to explain how or why something happens.

Numbers

- 2.5.1 Recognize and explain that, in measuring, there is a need to use numbers between whole numbers*, such as $2\frac{1}{2}$ centimeters.
- 2.5.2 Recognize and explain that it is often useful to estimate quantities.

* whole number: 0, 1, 2, 3, etc.

Shapes and Symbolic Relationships

- 2.5.3 Observe that and describe how changing one thing can cause changes in something else, such as exercise and its effect on heart rate.

Reasoning and Uncertainty

- 2.5.4 Begin to recognize and explain that people are more likely to believe ideas if good reasons are given for them.
- 2.5.5 Explain that some events can be predicted with certainty, such as sunrise and sunset, and some cannot, such as storms. Understand that people aren't always sure what will happen since they do not know everything that might have an effect.
- 2.5.6 Explain that sometimes a person can find out a lot (but not everything) about a group of things, such as insects, plants, or rocks, by studying just a few of them.

Standard 6

Common Themes

Students begin to observe how objects are similar and how they are different. They begin to identify parts of an object and recognize how these parts interact with the whole. They look for what changes and what does not change and make comparisons.

Systems

- 2.6.1 Investigate that most objects are made of parts.



Models and Scale

- 2.6.2 Observe and explain that models may not be the same size, may be missing some details, or may not be able to do all of the same things as the real things.

Constancy and Change

- 2.6.3 Describe that things can change in different ways, such as in size, weight, color, age, and movement. Investigate that some small changes can be detected by taking measurements.



NOTES

2